

Service Robots in Hotel Sector-Review

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Abstract. Robots have been applied in diverse areas nowadays, from industry to service industry. The robots perform their profession and their efficiency. Currently, the service robots industry is expanding in a rapid way and engineers aim to combine the robots with AI. The Service robots in hotels occupy a significant proportion of the robot industry. Numerous customers are shocked by how intelligent those robots are. However, there are still many issues about hotel service robots. This paper aims to introduce the hotel service robots and debate about the way to enhance it.

Keywords: robots, hotel service robots, human-robot interaction, artificial intelligence, domestic robots

1. Introduction

In the contemporary era, there is an increasing number of service robots that are used in our daily lives. Service companies are increasingly applying robots in their services [1]. The theme of artificial intelligence is controlling contemporary debates in the academic field and social media. There are different definitions of service robots; for example, Wirtz et al. [2] said that service robots are “system-based autonomous and adaptable interfaces that interact, communicate, and deliver service to an organization's customers.” The International Federation of Robotics [3] defines service robots are those” that perform useful works for humans or equipment excluding industrial automation applications.” Recently, some researchers have highlighted interactive components when service robots make and send different services. So, the development of service robots has a promising future.

Nevertheless, less attention has been given to the hotel sector than to other sectors, probably, that is because people have not realized how significant service robots in hotels can be. Even though this has caused backwardness in the development of robots, this situation will change in the future because of the economic depression. In an economic depression, the operators of the hotels want to find a workforce that can save money for them, and a service robot is a suitable substitution. Robots can be used in many aspects, for instance, they could be used in reception service, cleaning service, voice assistant, and room service delivery..... on the other hand, hotel service robots still have some shortages, for example, those robots are not strong enough in human-robots interaction and the insufficient of the combination of artificial intelligence.

Overall, service robots in the hotel sector have a significant position; they could help operators of hotels improve efficiency, reduce costs, and provide a unique experience for the guests. This paper

aims to illustrate the category of hotel service robots, the application of the service robots in hotels, put forward solutions to solving existing problems, and predict the future development of hotel service robots. This paper is organized as follows. The classification of the robots is presented in Section 2, Section 3 describes the application of service robots in hotels, human-robots interaction technology of front desk service robots is presented in Section 4, discussion is in Section 5 and conclusion is in Section 6.

2. Classification of robot categories

There are many kinds of robots in the world and the application areas of them are numerous, depending on this, in this paper we are going to discuss about personal service robots because they are close to our life.

2.1. Military robots

Military robots have a significant proportion in the field of professional robots. According to the former data, they can complete different works, ranging from bomb disposal to combat machines and defense territory. There are mainly three divisions of military robots: unmanned aerial vehicles (UAV), unmanned ground vehicles (UGS), and unmanned underwater vehicles (UUV).

2.2. Social robots

Social robots are basically seen as personal service robots or service robots for families. The duty of the robots is to work safely and efficiently surrounding people. They can improve people's lives throw teaching, amusing and helping. For example, PAL Robotics published REEM as a humanoid service robot [4]. They could help people deal with some issues and entertain people in different environments.

2.3. Assistance robots

This kind of robots possesses a significant role in personal service robots. Significantly, some hospitals or rehabilitation center prefer to using this kind of service robots to assist nurses or doctors to help the patients. We can classify different kinds of assistance robots according to the application places.

2.4. Medical robots

Nowadays, medical robots are widely used in medical field. The robots are used in diversity places in healthcare, it could help in rehabilitation, diagnosis and patient care, which could enhance the precision and efficiency in medical field. Generally, the medical robots can be classified in three main kinds: Delivery/Nurse such as Robear [5], Surgical such as CyberKnife Accuray's Cyberknife [6] and Recovery like Locomatpro's Hocoma [7].

Moreover, medical robots played a significant role in COVID-19. The medical robots helped people reduce contact with virus. They helped human disinfected hospitals, delivered food and water and medicine to patients and checked patients' temperature and condition. Some humanoid robots could even use UV light to kill the virus. By doing those tasks, the medical robots protected doctors and nurses and also enhance the efficiency of the medical works.

3. A promising kind of service robot: hotel robots

In the above paper, the paper presented different categories of service robots and summarized the different use of those service robots and the examples of them. In contemporaneity, an increasing number of companies pretends to develop innovative robots which has greater ability and wider application area, combining with artificial intelligence. Nevertheless, few experts and companies focus on the area of hotel even though this area possesses a significant market and could bring a great financial benefit for the companies and the operator of the hotels. Thus, in this session the paper will focus on diverse kinds of hotel service robots.

3.1. Reception robots

Primarily, Reception robots in hotels are powered by artificial intelligence are mainly designed for check-in and check-out processes and also enhance the efficiency of helping customers and save financial expenditure. Most of time, reception robots occur as a screen with a size of 10 to 15 inches, however, it is not literally a screen with an app for servicing customers. It usually be equipped with voice recognition (to help robots understand what customers say), identity verification systems (to make sure robots could scan passport or facial identification) and a powerful AI procedure which is rooted in the system of the robots(to help the robots deal with the questions). These robots could assist customers with complete registration, pay money or asking for room service independently, as well as reducing the time for wait. Comparing with human, there are both positive and negative sides. From positive perspective, the robots could work for 24 hours a day and 7 days a week without any break, at the same time, they will be never impatient with customers with great efficiency furthermore, the most important point for most people is that the robots will not leak the private information to anyone. On the other hand, negatively, they can not fully replace human stuff as they can not have emotional communication with human and they can not be seen as enthusiasm as some human stuffs are, thus, there are still many things need to be enhanced.

3.2. Hotel delivery robots

Delivering items such as meals, toiletries or luggage within hotels occupies a significant part in the service of hotel. Thus, hotel delivery robots are invented, they are AI-driven machined and aim to enhance the efficiency and guest satisfaction, furthermore, the application of them could reduce the number of stuffs and the save the financial spending. These robots normally use sensors such as lidar and camera to avoid obstacles such as pedestrian or walls and to plan the best ways. Those robots also could connect with the objects in hotel for example they can interact with elevators and security gates independently, enabling themselves to move between different floors. For instance, there is a robot called Lubot Delivery Robot (by lubide) and Jingwu Hotel robots are widely adopted in China.

The hotel delivery robots have key benefits including voice interaction for confirming delivery details, recognition of customers' faces and cooperate with hotel management systems for real-time work schedule. For example, Savioke Dash and Mikoly ZXX-80 robots highlight their ability to deal with every time operation and also reducing the load stuff take in peak hours. These robots also collect the servicing data to increase the quality of service.

These robots are particularly valuable in large hotels or airports, such as Shenzhen Airport, where they streamline luggage transport and reduce human error. By automating repetitive tasks, they lower operational costs and improve service speed, ensuring timely deliveries even during high-

demand periods like holidays. As technology evolves, future iterations may integrate deeper AI capabilities, such as personalized recommendations based on guest behavior analysis.

4. The technology of the delivery robots

Speech recognition is one of the main roles of the service robots. The module of speech recognition is the main way of receiving the commands from customers. For example, the delivery robots could deliver goods, record users' data and understand customers' needs through speech recognition module. In order to realize those functions, the most important technology is presented in the next list. Taking orders from customers like ordering food and drinks, Delivering orders to the corresponding customers, Welcoming clients at the entrance, Guiding the customers to their sits, cheering clients up by recognizing their mood and taking reservations for the seats.

In order to enhance human-robot interaction and make sure the robots could understand the demand of the customers also make the robots more intelligent. One of the solutions is via speech recognition. There are numerous different kinds of ways to recognize the speeches. For instance, there are some classic solutions. MFCC, RAGCHS and Random Attraction Model and Firefly Algorithm which bonds Harmony Search with random attraction to enhance speech recognition system for interactive teaching. There is also an advanced algorithm which is called CNN(for speech recognition) Using of CNN algorithm could provide an easy and stable way to implement the 3D virtual human model.

Overall, with the development of artificial intelligence, the innovative AI algorithm gradually replace the traditional speech recognition algorithm. Nevertheless, in order to enhance the speech ability of service robots and make them more efficient and flexible, it requires numerous data to practice the model

5. Conclusion

In contemporary era, the application of the service robots in the hotel spreads in a rapid way. An increasing number of Chinese hotels have applied delivery robots to deliver food and personal hygiene products for customers, which is efficient. However, there are many disadvantages which have room for improvement, for example, the service robots are not flexible enough which means it can not accomplish customers' command in a satisfying way, the robots are also not pleasing to customers' eyes and the most significant point is the robots are not intelligent enough which means they can not communicate like a human being, this could disturb clients living experience.

Moreover, there are many solutions to those issues, firstly, to enhance the intelligence and the flexibility of service robots, there should be integration of service robots with AI large language models. Secondly, service robots should better be humanoid robots because humanoid robots are suitable to infrastructure and this kind of robots could make the customers feels more comfortable.

Overall, humanoid robots combined with artificial intelligence is the development direction in the future, hotels should build more infrastructures which are more suitable for humanoid robots. AI large language models should also be enhanced with inferential capability until the model could match human's logic.

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